

MANUFACTURING

A student who has completed the Job Corps Manufacturing program is equipped with the skills to contribute to the workplace as a valued employee from day one. Competence in academic and vocational skills is required for graduation. In addition, Job Corps students learn employability and technological skills. To complete his or her Manufacturing training, a student must master skills in these categories:

SAFETY

Personal safety: identify and use clothing and personal protective equipment worn to ensure safety such as shoes, goggles and helmets; implement necessary housekeeping procedures to ensure a safe working environment; locate and use Material Safety Data Sheets; implement first aid or first response procedures; demonstrate the use of various safety equipment; use proper techniques for safely moving materials; document a safety concern; safely evacuate the facility during simulations of a fire and power failure; explain cleanup procedures for spills of various substances and locate spill kits; identify hazardous materials to ensure they are stored and labeled appropriately; inspect machine functions to determine if various safeguards are operational; describe safety procedures in case of smoke or chemical inhalations; demonstrate appropriate procedures for responding to shop emergencies; lock out machine tool using correct lock/tag-out practice and the steps following the practice; explain the basic role of OSHA and other health/safety requirements as applied to workplace health and safety; explain basic regulation governing safe use of equipment; demonstrate a working knowledge of the Hazardous Materials Information System labeling procedures; explain the purpose of ISO 14000 and identify two local companies that are ISO 14000-certified; relate the safety procedures skills to a specific workplace or a specific shop project.

BUSINESS AND MANUFACTURING PRINCIPLES

Describe the role of different types of businesses in providing goods and services to customers; explain a business organizational structure; demonstrate understanding of three basic business models in manufacturing by identifying companies which fit the operation excellence, product innovation and customer intimacy models; identify sources of profit and loss within a business; discuss the role of individual employees in maximizing profit and minimizing loss; explain "productivity" and why it is important in manufacturing; describe the business structure in a 21st century manufacturing plant; identify favorite products and classify them by manufacturing segment; explain why teamwork is important in manufacturing; complete a project that demonstrates one-piece flow and identify two advantages the method has over batch production; complete a 5S project in the lab or on a field trip as part of a team; make a display board, chart or other visual aid; identify eight different waste sources that lean manufacturing tries to eliminate; explain the term "competition" and identify the "competitive advantage" held by one of the local manufacturing companies; explain supply and demand; identify products with "value" and how value might impact price; discuss how an individual worker can add value to products and services; identify examples of internal and external customers; identify the critical factors of customer service; identify and use important customer service communication skills; define "quality"; discuss the importance of inventory control and record keeping for quality systems; identify and use basic terminology common in the manufacturing workplace; participate in a corrective action team which completes a corrective action report in response to a simulated customer complaint; use customer complaints as a measure of quality; use of appropriate company forms and documents including In Process Inspection Records, Discrepant Material Reports, SPC charts and production logs.

DESIGN PROCESS ONE UNIT

Use basic CAD drawing commands to make a pictorial drawing of a two-dimensional object; edit a CAD drawing; identify and use basic blueprint terminology; identify part name, number, revision level and data on authentic production prints from companies; demonstrate understanding of projection of views by identifying a specified set of features in three different views; calculate unspecified linear angular dimensions from dimensions given in print; sketch a dimensioned multi-view drawing of an object; use CAD software to create a dimensioned, scaled multi-view drawing; create and use a CAD schematic symbol library; title block and CAD macro that accepts user input; use CAD to create three types of sectional views for an object; identify the size and type of a fastener; use a CAD system to draw a thread representation; create isometric objects using CAD software; create a three-dimensional object using three-dimensional CAD drawing commands; use CAD to create a layered two-dimensional layout of a production facility; analyze a production process to determine throughput; use CAM software to create a CNC program that uses a two-dimensional contour toolpath.

MANUFACTURING PROCESS ONE UNIT

Select stock size and type given a part drawing; use a horizontal band saw to cut stock to a specified length; enter and edit a program in the CNC mill using the machine keypad; operate a CNC machine; design a CNC program using linear interpolation; design a CNC mill program using absolute and incremental positioning; design an SNC mill program using circular interpolation; set up CNC mill for first piece run; use basic layout techniques to prepare a work piece of drilling holes such as the benchwork part for the NIMS Job Planning, Benchwork and Layout credential; use a drill press to drill holes in a part; use a drill press to ream, countersink, counterbore, tap and chamfer a hole; tap a hole using a tap and tap wrench; use a bench vise to hold materials for a benchwork operation; cut a piece of stock to length using a hacksaw; change a hacksaw blade; stamp letters using a letter/number stamp set; perform basic file operations; use a milling machine to face stock; mill a step in part; mill a slot to a specific depth; mill a pocket in part; use a manual lathe to face a part; use a lathe to turn a part to a specified diameter; perform a rough lathe cut on a part; use automatic lathe feed; create an external chamfer, square groove on a part, external threads on a part using a lathe; drill a hole to a specified depth using a lathe; cut internal threads into a blind hole; properly lubricate equipment; report problems to supervisors; complete repair activity reports; maintain records and documents of machine operations and reliability; use Machinery's Handbook to find tap drill sizes, formulas for shop calculations, fit and tolerance information, thread parameters; identify carbide cutting tools and explain the advantages of carbide-tipped cutters; identify tools for milling, turning and grinding; recognize, name and describe the primary functions of common pieces of metalforming equipment; identify warning signals from malfunctioning equipment and demonstrate the appropriate response.

QUALITY ASSURANCE ONE UNIT

Measure a length with a metric rule, decimal inch rule, rule graduated in common inch fractions, tape measure; convert between common inch fractions and decimal fractions; convert a length measurement between U.S. customary units and S.I. units; use a caliper, digital caliper and outside micrometer to measure length of a part feature; calibrate precision measuring tools; demonstrate proper care for precision measuring instruments; use scales, dividers, calipers and squares to correctly lay out a part such as the part for the layout portions of the NIMS Job Planning, Benchwork and Layout; use scales combination squares, micrometers, protractors and dial calipers to verify product conformance to print requirements; use a dial and digital indicator to measure the length of a part feature; use data acquisition software to collect and display data from a digital indicator; manually construct a histogram given a set of data; construct a histogram using SPC software; analyze a histogram; manually construct and record process data on an X-Bar and R chart; use SPC software to record and chart data from production measurements using X-Bar and R charts and histograms; analyze an X-bar and R chart from a manufacturing project and use the analysis to better control the process; create a cause and effect diagram as part of a brainstorming process; construct a Pareto diagram; determine if a part dimension is within tolerance using conventional tolerancing; determine the type of fit between two mating parts; make a sketch of a part using baseline dimensioning; sketch a drawing with geometric dimensioning and tolerancing symbols; determine if a produced hole is within tolerance given data; use a small hole gauge to measure the diameter of a hole; measure the length and orientation features of a part using an indicator; determine if a part meets an orientation tolerance; measure the form tolerance of a part using an indicator; determine if a part meets a form tolerance given a specification; explain the difference between quality control of the product and process control of its production.

MANUFACTURING PROJECT

Describe the manufacturing process flow to make a particular finished product; demonstrate knowledge of the SAE steel identification system; use a router of job process sheet to locate part number, drawing number, revision level, quantity to be produced, the sequence of operations and other relevant information; calculate the amount of material required for a specific order, locate and/or order materials needed for production per requisitioning procedures; verify conformance of incoming materials to required properties and specification, dispose non-conforming materials according to quality procedures; store, handle and track material according to company procedure; handle scrap material correctly; identify the tools and equipment required, determine if additional tools/equipment need to be procured based on production run; identify various cutting lubricants/coolants and their proper application; segregate good products from non-conforming products, dispose non-conforming materials according to quality procedures; discuss the concept of Just In Time production as applied to this project, ship per customer requirements; clean and store hand tools, cutters, jigs, fixtures and attachments; complete job forms and documents such as In Process Inspection Sheets, SPC charts and production logs as required; describe and follow company specific policies and procedures; identify and respond to internal and external customer needs.